17.5.3 CB/NT
HYESD
5.2.6.2

CB/NT
HYESD
5.2.6.2

Mary Riveland
[redacted]
Director

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, LU-11 • Olympia, Washington 98504-8711 • (206) 753-2353

May 4, 1993

Ms. Karen Keeley
U.S. Environmental Protection Agency
Region X
1200 6th Avenue, HW-113
Seattle, WA 98101-3188

Re: Milestone 1 Source Control Status Report for Head of Hylebos
Problem Area: Commencement Bay Nearshore/Tideflats Superfund Site

Dear Ms. Keeley:

I have enclosed the Milestone 1 Report for the Head of Hylebos Waterway Problem Area at the Commencement Bay Nearshore/Tideflats (CBN/T) Superfund Site. For the purpose of identifying potential sources of problem chemicals, EPA and Ecology define the "Head of Hylebos Waterway" as that portion of the Hylebos Waterway southeast ("upstream") of Lincoln Avenue. The report contains a table that identifies all ongoing potential sources of problem chemicals (List 1), all probable sources (List 2), and all confirmed sources (List 3). All lists are included on the same table. In addition, List 3 sites are also printed separately (last two pages). A map is also enclosed with numbered locations for each site.

In deciding how to list facilities, Ecology used the source identification process described in the EPA document titled: "Source Control Strategy: Commencement Bay Nearshore/Tideflats Superfund Site (May, 1992)." The listing process was designed to determine which sites located on the Head of Hylebos are sources of problem chemicals. The problem chemicals used were those identified on the attached tables for both the Mouth and the Head of the Hylebos. "Problem chemicals" are those which have been found in Hylebos sediments above levels considered harmful to biota and human health and are listed in EPA's Record of Decision for the Commencement Bay Nearshore/Tideflats Superfund site.

List 1 includes all parties on the Head of Hylebos who were issued a General Notice Letter by EPA and other parties immediately adjacent to the Head of Hylebos Waterway. In addition, List 1 includes other potentially significant contributors of problem chemicals to the Head of Hylebos Problem Area via storm drains, Hylebos Creek, and Fife Ditch. List 2 excludes some List 1 sites based on information obtained from file searches and site visits. List 3 sites are confirmed sources based on analysis of samples for contaminants in soil, sediment, ground water, or surface water. Sources listed as "major sources" in the EPA Record of Decision are identified.

A few facilities may be removed from List 3 if investigations performed by the facilities convince Ecology that they do not contribute problem chemicals to

the Hylebos Waterway. In addition, a few facilities may be added to List 3 based on new information.

List 3 includes two sources to Hylebos Creek and two sources to the confluence of Hylebos Creek and Hylebos Waterway. Based on extensive inspection work conducted and data collected in the Hylebos Creek drainage (includes Fife Ditch), Ecology does not believe that source control work at additional sites is needed at this time. Ecology's work in Hylebos Creek was supported heavily by Tacoma Pierce County Health Department, the City of Tacoma, and EPA.

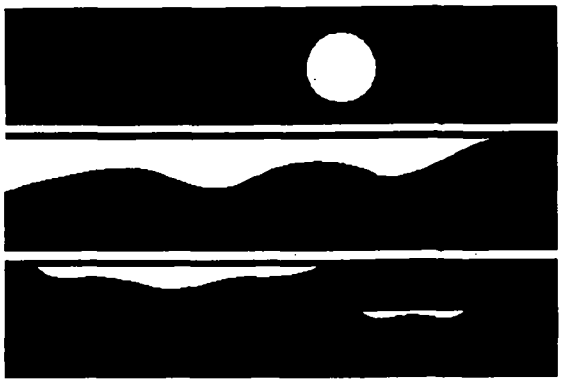
Excluding City of Tacoma storm drains, Ecology identified 49 potential sources for List 1, 26 probable sources for List 2, and 17 confirmed sources for List 3.

Sincerely,

Dave Smith

Dave Smith
Unit Supervisor
Southwest Regional Office
Toxics Cleanup Program

DS:ak



WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Commencement Bay Nearshore/Tideflats
Head of Hylebos Waterway
Source Control Status Report:
Milestone 1

Washington Department of Ecology
Toxics Cleanup - SWRO
Urban Bay Action Team

May 1993

PROBLEM CHEMICALS IN HEAD OF HYLEBOS WATERWAY

Priority[a]	Chemical
Priority 1	PCBs
	HPAH
	Arsenic
	Zinc
Priority 2	Copper
	Antimony
	Lead
	Nickel
	Mercury
	Tetrachloroethene
	Phenol
Priority 3	Methylpyrene[b,c]
	Methylphenanthrene[b,c]
	Dibenzothiophene[b,c]
	Ethylbenzene
	Xylene
	Chlorinated benzenes
	Chlorinated butadienes
	Bis[2-ethylhexyl]phthalate[d]
	Benzyl alcohol
	Alkylated benzene isomer[b,c,e]

Note: The Head of Hylebos Problem Area is comprised of Segments 1 and 2 as described in Tetra Tech (1985) (see Figure 12 of the Record of Decision).

[a] **Priority 1 problem chemical**—Detected at concentrations exceeding apparent effects thresholds, and the spatial distribution of this chemical corresponds to gradients of observed toxicity or benthic effects.

Priority 2 problem chemical—Detected at concentrations exceeding apparent effects thresholds at more than one station, but shows no particular spatial relationship with gradients of observed toxicity or benthic effects.

Priority 3 problem chemical—Detected at concentrations exceeding apparent effects thresholds at only one station in a problem area or is the highest recorded concentration of that chemical in the Puget Sound database.

[b] Additional information on these tentatively identified compounds is discussed on pp. 41–52 of Tetra Tech (1986b).

[c] The Record of Decision does not include a CB/NT cleanup objective for this constituent.

[d] Bis [2-ethylhexyl]phthalate was the only phthalate ester identified as a Priority 3 chemical for the Head of Hylebos Problem Area in Tetra Tech (1986b) (pp. 28–34), although some text broadly refers to "phthalate esters" as Priority 3 chemicals [e.g., p. 6.34 of Tetra Tech (1985) and p. 19 of Tetra Tech (1986b)].

[e] In Tetra Tech (1986b) (p. 21), the alkylated benzene isomer was tentatively identified as a cymene isomer (e.g., 1-methyl[4-methylethyl]benzene and 1-methyl[2-methylethyl]-benzene).

PROBLEM CHEMICALS IN MOUTH OF HYLEBOS WATERWAY

Priority[a]	Chemical
Priority 1	PCBs
Priority 2	Hexachlorobenzene
	Trichloroethene[b]
	Tetrachloroethene
	1,2-Dichlorobenzene
	1,3-Dichlorobenzene
	Hexachlorobutadiene
	Pentachlorocyclopentane isomer[b,c]
	Lead
Priority 3	HPAH
	LPAH
	Methylphenanthrene[b,d,e]
	Methylpyrene[b,d,e]
	Biphenyl[b,e]
	Phenol
	Benzyl alcohol
	Copper
	Zinc
	Mercury

[a] **Priority 1 problem chemical**—Detected at concentrations exceeding apparent effects thresholds, and the spatial distribution of this chemical corresponds to gradients of observed toxicity or benthic effects.

Priority 2 problem chemical—Detected at concentrations exceeding apparent effects thresholds at more than one station, but shows no particular spatial relationship with gradients of observed toxicity or benthic effects.

Priority 3 problem chemical—Detected at concentrations exceeding apparent effects thresholds at only one station in a problem area or is the highest recorded concentration of that chemical in the Puget Sound database.

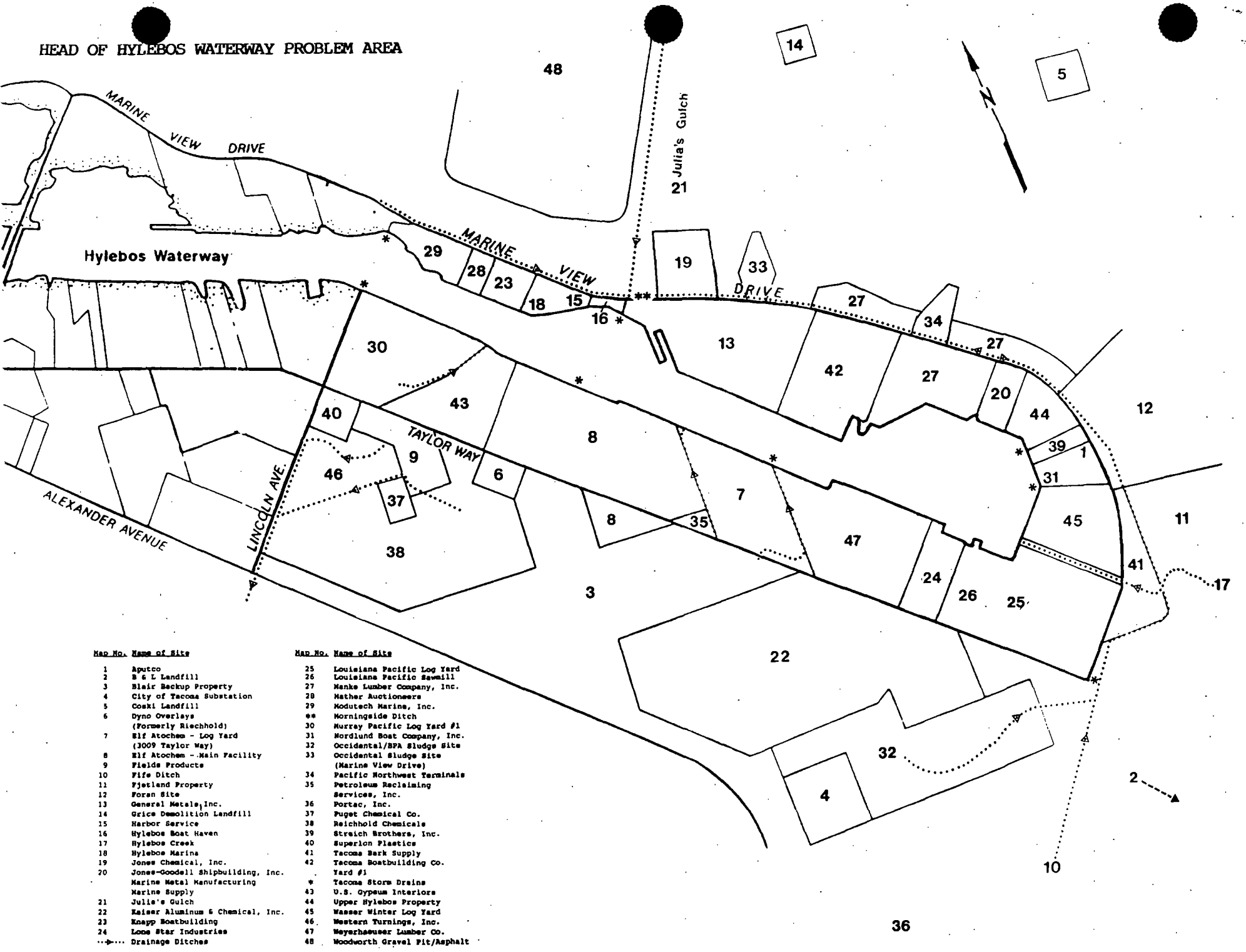
[b] The Record of Decision does not include a CB/NT cleanup objective for this constituent.

[c] The pentachlorocyclopentane isomer, a tentatively identified compound, is discussed in Tetra Tech (1985) (p. 7.73).

[d] Methylphenanthrene and methylpyrene were not listed as Priority 3 chemicals in Tetra Tech (1985) (Table 6.14, p. 6.35) or Tetra Tech (1986b); however, supporting text in the latter report (pp. 48–52) identifies these two compounds as Priority 3 chemicals.

[e] Additional information on these tentatively identified compounds is discussed on pp. 41–52 of Tetra Tech (1986b).

HEAD OF HYLEBOS WATERWAY PROBLEM AREA



Map No.	Name of Site
1	Aputco
2	B & L Landfill
3	Blair Backup Property
4	City of Tacoma Substation
5	Coski Landfill
6	Dyno Overlays (Formerly Riechhold)
7	Elf Atochem - Log Yard (3009 Taylor Way)
8	Elf Atochem - Main Facility
9	Fields Products
10	Fife Ditch
11	Fjetland Property
12	Foran Site
13	General Metals, Inc.
14	Grice Demolition Landfill
15	Harbor Service
16	Hylebos Boat Haven
17	Hylebos Creek
18	Hylebos Marina
19	Jones Chemical, Inc.
20	Jones-Goodell Shipbuilding, Inc. Marine Metal Manufacturing Marine Supply
21	Julia's Gulch
22	Kaiser Aluminum & Chemical, Inc.
23	Knapp Boatbuilding
24	Lone Star Industries
···▶···	Drainage Ditches

Map No.	Name of Site
25	Louisiana Pacific Log Yard
26	Louisiana Pacific Sawmill
27	Manke Lumber Company, Inc.
28	Mather Auctioneers
29	Modutech Marine, Inc.
**	Morningside Ditch
30	Murray Pacific Log Yard #1
31	Nordlund Boat Company, Inc.
32	Occidental/BPA Sludge Site
33	Occidental Sludge Site (Marine View Drive)
34	Pacific Northwest Terminals
35	Petroleum Reclaiming Services, Inc.
36	Portac, Inc.
37	Puget Chemical Co.
38	Reichhold Chemicals
39	Streich Brothers, Inc.
40	Superlon Plastics
41	Tacoma Bark Supply
42	Tacoma Boatbuilding Co. Yard #1
*	Tacoma Storm Drains
43	U.S. Gypsum Interiors
44	Upper Hylebos Property
45	Wasser Winter Log Yard
46	Western Turnings, Inc.
47	Weyerhaeuser Lumber Co.
48	Woodworth Gravel Pit/Asphalt

HEAD OF HYLEBOS WATERWAY PROBLEM AREA
COMMENCEMENT BAY NEARSHORE/TIDEFLATS SUPERFUND SITE(a)
Potential, Probable, and Confirmed Sources(b)

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
7	3009 Taylor Way (see Elf Atochem Log Yard)	x	x		See Elf Atochem Log Yard.
1	APUTCO 1630 Marine View Drive Tacoma, WA 98422			Not sampled. Existing information suggests that problem chemicals are not associated with this site.	Formerly Republic Supply Co. Entire operation moves to Alaska May-November every year.
8	Atochem (See Elf Atochem Main Facility)	x	x		See Elf Atochem Main Facility.
11	B & L Construction and Trucking (See Fjetland Property)			Listed under Fjetland Property.	Drains to Hylebos Creek.
2	B & L Landfill Milton, Washington	x	x		Major site. Drains to Hylebos Creek. MTCA cleanup will be done by summer 1993.

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
3	Blair Backup Property Puyallup Land Settlement Agreement Property	x	x		Major site. Includes former Cascade Timber Log Yard #2 site. EPA site. Cleanup done by 6/93.
32	Bonneville Power Admin. (BPA) 3702 Alexander Avenue Tacoma, WA 98421			Discharges to Fife Ditch. See Fife Ditch.	Also listed as Occidental - BPA sludge site. Drains to Fife Ditch. See Fife Ditch.
3	Cascade Timber Log Yard #2 (see Blair Backup Property)	x	x	Listed under Blair Backup Property.	Listed under Blair Backup Property.
*	City of Tacoma Storm Drains (multiple locations-incl. Morningside Drain)	x		Average particulate data for Morningside Drain and other city drains show no exceedances of the CB/NT Sediment Quality Objectives for Hylebos Waterway. Ecology enforcement action not needed at this time.	Water and sediment samples taken by Ecology, City of Tacoma, TPCHD. City of Tacoma developing Part II application for its municipal stormwater permit. Water quality standards exceeded in some cases.
4	City of Tacoma Substation Alexander Avenue			Drains to Blair Waterway.	

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
/	Commencement Bay Fisheries (address not found)			No address found. Site could not be located.	
5	Coski Landfill 5403 Pendle Lange Rd. Tacoma, WA 98422	x		Sampled. Low levels of problem chemicals identified in drainage downstream from site. Existing information indicates that an enforcement action for source control is not needed at this time.	Sediment samples taken in drainage behind/above Manke Lumber did not appear contaminated. Earlier samples from seeps directly below the site contained PCBs. Site is on state Hazardous Sites List.
28	Don Oline Marine View Dr. Autofluff Marine View Drive Tacoma, WA 98421	x	x		Independent cleanup started. Formerly referred to as Mathers Auctioneers site.
7	Dunlap Towing (see Elf Atochem Log Yd.)	x	x	Site is now known as Elf Atochem Log Yard.	
6	Dyno Overlays 2340 Taylor Way Tacoma, WA 98421			Drains to Blair Waterway.	On same land as Reichold Chemicals.

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
/	E.M. Haub (address not found)			No address found. Could not be located.	
7	Elf Atochem Log Yard 3009 Taylor Way Tacoma, WA 98421	X	X		Major site. Also known as Dunlap Towing, 3009 Taylor Way Site, Echo Lumber. MTCA cleanup done. Site delisted 2/93.
8	Elf Atochem Main Facility 2901 Taylor Way Tacoma, WA 98421	X	X		Major site. Formerly Pennwalt, Atochem. MTCA cleanup construction done; pump & treat of groundwater proceeding.
9	Fields Products 2240 Taylor Way Tacoma, WA 98421			stormwater and groundwater drains to Blair.	
10	Fife Ditch	X		Sampled. Problem chemicals identified, but extensive existing information indicates that enforcement actions for source control (potential sources to the ditch) are not needed at this time.	See Attachments A, B, and C.

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
11	Fjetland Property 1621 Marine View Drive Tacoma, WA 98422			Drains to Hylebos Creek. See Hylebos Creek.	Also known as Earth Enterprises, B&L Construction and Trucking, Portside Recycling, and Executive Bark.
12	Foran Site 1635 Marine View Drive Tacoma, WA 98422			Drains to Hylebos Creek. See Hylebos Creek.	
13	General Metals, Inc. 1902 Marine View Drive Tacoma, WA 98422	x	x		Major site. Phased MTCA cleanup ongoing; completion due 1995. NPDES permit in effect for storm water treatment system.
14	Grice Demolition Landfill 25th St NE & 62nd Ave Tacoma, WA	x		Sampled. Problem chemicals identified at low levels in sediments downstream of site. Existing information suggests that enforcement actions for source control are not needed at this time.	
15	Harbor Service 1940 Marine View Drive Tacoma, WA			Not sampled. Boat yard that only works on motors. Existing information suggests that this facility does not contribute problem chemicals to the waterway.	
/	Hydro Systems Engineering			Site not found.	Site listed on EPA CBN/T Feasibility Study Figure 5.1 as combined with Modutech Marine. It does not now exist at that location.

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
16	Hylebos Boat Haven Next to Hylebos Marina to the east.			Marina only. No upland uses or boat maintenance area.	
17	Hylebos Creek (Excluding Fife Ditch)	x		Sampled. Four List 3 sites: USG Landfill, B&L Landfill, Wasser Winters, and Louisiana Pacific. Based on extensive investigative work, Ecology does not believe that source control work at additional sites is needed.	See Attachments A, B, and C.
18	Hylebos Marina 1940 Marine View Drive Tacoma, WA 98422	x	x		Formerly Yacht Doctor. Mather Auctioneers, Knapp Boatbuilding on adjacent leased parcels. Applied for Small Boatyard Permit.
/	Indian Fish Company			See Hylebos Marina (Mather Auctioneers).	
/	Johnson Engineering			Site is now Modutech Marine.	

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
19	Jones Chemicals, Inc. 1919 Marine View Drive Tacoma, WA 98422	x		Sediments sampled. Problem chemicals not identified in samples downstream from site.	Samples from refuse pile on property exceeded sediment cleanup objectives, but downstream samples did not show problems. Refuse pile removed April, 1992.
20	Jones-Goodell Corp. 1690 Marine View Drive Tacoma, WA	x	x		Applied for Small Boatyard Permit.
21	Julia's Gulch no street address			Sampled. Problem chemicals not identified above sediment cleanup objectives.	Catch basin samples taken behind Jones Chemical. Grice Landfill and Woodworth Gravel pit drain through this ravine. Large sediment input from gravel pit.
22	Kaiser Aluminum and Chemical Corp. 3400 Taylor Way Tacoma, WA 98421	x	x		Major site. Upgraded NPDES permit being implemented. MTCA cleanup done.
23	Knapp Boatbuilding (See Hylebos Marina)			Not sampled. Existing information suggests that this facility does not contribute problem chemicals to the waterway.	Located on land leased from Hylebos Marina. There appears to be several independent lessees on the site. Knapp building appears to be inactive. May need to be included w/Hylebos Marina permit.

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
24	Lone Star Industries 3601 Taylor Way Tacoma, WA 98421	x		Not sampled. Existing information suggests that problem chemicals are not associated with this facility.	Formerly Glacier Sand and Gravel.
25	Louisiana Pacific Log Yard 3825 Taylor Way Tacoma, WA 98421	x	x		Major site. MTCA cleanup site. Enforcement Order for site cleanup signed 1992. Cleanup scheduled for summer of 1993.
26	Louisiana Pacific Sawmill 3701 Taylor Way Tacoma, WA 98421			Not sampled. Existing information suggests that this facility does not contribute problem chemicals to the waterway.	
27	Manke Lumber Company, Inc. 1717 Marine View Drive Tacoma, WA 98422	x		Sampled. Problem chemicals identified at low levels, but existing information indicates that an enforcement action for source control is not needed at this time.	
20	Marine Metal Manufacturing 1690 Marine View Drive Tacoma, WA 98421			Same site as Jones-Goodell.	Figure 5-1 in CBN/T Feasibility Study shows wrong location. It is a part of Jones-Goodell Corp.
20	J&G Marine Supply 1690 Marine View Drive Tacoma, WA 98421			Retail store at Jones Goodell.	Figure 5-1 shows this as on the north next to Jones-Goodell, but is incorrect. Site to the north is now part of Manke Lumber.

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
28	Mather Auctioneers Marine View Drive Tacoma, WA 98421	x	x		See "Don Oline Marine View Drive Autofluff Site".
/	Milgard Mfg./Tempering 1010-54th Avenue East Fife, WA 98411-0368			Discharges to Fife Ditch. See Fife Ditch.	TPCHD study included this site. Also sampled by Ecology. Discharges process wastewater to Fife Ditch.
29	Modutech Marine, Inc. 2218 Marine View Drive Tacoma, WA 98422	x	x		Applied for a Small Boatyard Permit. Independent sandblast grit cleanup ongoing.
**	Morningside Ditch No street address	x		Average particulate data for Morningside Drain shows no exceedances of sediment cleanup objectives for Hylebos Waterway.	
30	Murray Pacific Log Yard #1 3542 Lincoln Avenue	x	x		MTCA cleanup site. Cleanup due in 1994.
31	Nordlund Boat Company, Inc. 1622 Marine View Drive Tacoma, WA 98421	x	x		Will apply for Small Boatyard Permit.

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
32	Occidental - BPA Sludge Site 3702 Alexander Ave. Tacoma, WA 98421			See Bonneville Power Admin. (BPA)	Drains to Fife Ditch.
33	Occidental - Marine View Drive Sludge Site	x		Sampled. Trichloroethene and tetrachloroethene in ground water in sludge fill, but data do not show migration off site.	Located across Marine View Drive from General Metals. Trichloroethene and tetrachloroethene in ground water in sludge fill, but data do not show migration off-site.
34	Pacific Northwest Terminals 1749 Marine View Drive Tacoma, WA 98421			Not sampled. Existing information suggests that problem chemicals are not associated with this facility.	
/	Pan Pacific Trading 3502, 3452 Lincoln Avenue Tacoma, WA			No longer exists. Site is now Murray Pacific log yard.	
/	Pederson Oil 1622 Marine View Drive Tacoma, WA 98422			Office building.	On same property as Nordlund Boat.
8	Pennwalt Corporation 2901 Taylor Way Tacoma, WA 98421			This site is listed as Elf Atochem Main Facility.	

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
35	Petroleum Reclaiming Services, Inc 3003 Taylor Way Tacoma, WA 98421	x	p	Sampled. Status pending results of State Dangerous Waste investigation.	
36	Portac, Inc. 4215 East-West Rd. Tacoma, WA 98421			Discharges to Blair Waterway.	
37	Puget Chemical Company 2160 Taylor Way Tacoma, WA 98421			Discharges to Blair Waterway. Building abandoned.	Included with Reichold Chemical cleanup. Building will be torn down by Reichold.
/	R.W. Investments (see Western Turnings)			Discharges to Blair Waterway.	Same site as Western Turnings.
38	Reichold Chemicals 3320 Lincoln Avenue Tacoma, WA 98421			Discharges to Blair Waterway.	RCRA cleanup site.
/	Republic Supply Company			Site is now APUTCO.	

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
/	Scott and From			Site not located. No address found.	
/	Seaport Bark Supply 3542 Lincoln Avenue Tacoma, WA 98421			Listed as Murray Pacific Log Yard #1.	
39	Streich Brothers, Inc. 1650 Marine View Drive Tacoma, WA 98422			Not sampled. Existing information suggests that this site does not contribute problem chemicals to the waterway.	
40	Superlon Plastics 2116 Taylor Way Tacoma, WA 98421			Front (parking, storage) area drains to Hylebos. Main drainage goes to Blair Waterway.	Soil contamination in basement (drainage to Blair). Referred for initial MTCA or dangerous waste investigation (Ecology).
41	Tacoma Bark Supply 1537 Marine View Drive E Tacoma, WA 98422			Discharges to Hylebos Creek. See Hylebos Creek.	Site is now vacant.
42	Tacoma Boatbuilding Co. Yard #1 1840 Marine View Drive Tacoma, WA 98421	x	x		Major site. NPDES permit issued 3/93.

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
/	Tacoma Marine Electric 1622 Marine View Drive Tacoma, WA 98422			Not sampled. Existing information suggests that problem chemicals are not associated with this facility.	On same property as Nordlund Boat. Retail/office.
43	U.S. Gypsum Interiors 2301 Taylor Way Tacoma, WA 98421	x	x		Formerly U.S. Gypsum Company. Problem chemicals identified in seeps from the site. Ecology drafting an Agreed Order for site investigation.
/	U.S. Gypsum Landfill U.S. Highway 99 Pierce Co., WA 98354	x	x	Drains to Hylebos Creek. Site cleanup started in 1984.	Drains to Hylebos Creek. Site cleanup took place in 1984. Post-cleanup monitoring shows groundwater contaminants are decreasing, approaching MTCA cleanup levels.
44	Upper Hylebos Property Puyallup Settlement Land Marine View Drive			Investigated under EPA/Ecology MOA with the Port and Tribe. Determined to require no cleanup action.	
45	Wasser Winters 1602 Marine View Drive Tacoma, WA 98422	x	x		Major site. MTCA cleanup site. Site expected to be cleaned up summer of 1993.
/	Western Superior Structurals Mfg. 6713 Pacific Highway East Fife, WA 98424			Drains to Hylebos Creek. See Hylebos Creek.	Formerly Western Engineering.

Map No.	List 1 (Potential Sources)	List 2 (Probable Sources)	List 3 (Confirmed Sources)	Reason Site is Not on List 3	Comments/Notes
46	Western Turnings, Inc. 2150 Taylor Way Tacoma, WA 98421			Discharges to Blair Waterway.	Out of business. Site used currently as a log sort yard.
47	Weyerhaeuser Lumber Co. 3401 Taylor Way Tacoma, WA 98421	x		Not sampled. Existing information suggests that problem chemicals are not associated with this facility.	
48	Woodworth Gravel Pit/Asphalt Plant Norpoint Way Tacoma, WA 98422	x		Not sampled. Downstream Catch basins on Norpoint Way and behind Jones Chemical sampled. Existing information shows enforcement action for source control not required at this time.	Drainage is through Julia's Gulch and via pipe to the Morningside drain.
/	Yacht Doctors 1950-1/2 Marine View Dr Tacoma, WA 98422			Listed as Harbor Services.	

FOOTNOTES

(a) For source identification, the Head of Hylebos Waterway is defined as that portion of Hylebos Waterway south and east of Lincoln Avenue.

(b) Potential sources (List 1) were considered to be all sites with drainage to Hylebos Waterway. Sites in Hylebos Creek which received an EPA General Notice Letter were also included on List 1. Sites were put on List 2 after inspections revealed they were probable sources of problem chemicals to the waterway. Sites were put on List 3 after sampling or further investigation showed that the site was an ongoing confirmed source of problem chemicals to Hylebos Waterway. Documentation why sites were not placed on List 3 is briefly described in the fifth column of this report. Specific information about sites placed on List 3 is is found on List 3 - Confirmed Sources. Additional detail is provided in Ecology's site files, inspection reports, and in a Head of Hylebos Problem Area inspection notebook maintained by the Ecology UBAT supervisor at the Southwest Regional Office.

HEAD OF HYLEBOS WATERWAY PROBLEM AREA
COMMENCEMENT BAY NEARSHORE/TIDEFLATS SUPERFUND SITE(a)

List 3 - Confirmed Sources(b)

5/05/93

Map No.	Site Name(c)	Status	Contaminants(d)	Pathways
2	B & L Landfill	Major site. Drains to Hylebos Creek. MTCA cleanup will be done by summer 1993.	As, Cu, Pb, Zn	stormwater, groundwater
3	Blair Backup Property	Major site. Includes former Cascade Timber Log Yard #2 site. EPA site. Cleanup done by 6/93.	As, Cu, Pb, Zn, Cr	stormwater
28	Don Oline Marine View Dr. Autofluff	Independent cleanup started.	Cd, Cu, Pb, Zn, Ni, PCB's	stormwater, shoreline sediments
7	Elf Atochem Log Yard	Major site. Also known as Dunlap Towing, 3009 Taylor Way Site, Echo Lumber. MTCA cleanup done. Site delisted 2/93.	As, Cu, Pb, Zn	stormwater
8	Elf Atochem Main Facility	Major site. Formerly Pennwalt, Atochem. MTCA cleanup construction done; pump & treat of groundwater proceeding. NPDES permit.	As, Cu	groundwater
13	General Metals, Inc.	Major site. NPDES permit in effect for stormwater treatment system. Phased MTCA cleanup ongoing; completion due 1995.	PCBs, As, Cu, Pb, Zn	stormwater
18	Hylebos Marina	Applied for Small Boatyard Permit. Formerly Yacht Doctor. Mather Auctioneers and Knapp Boatbuilding on adjacent leased parcels.	Cu, Zn	point source (boat wash)
20	Jones-Goodell Corp.	Applied for Small Boatyard Permit. Independent grit cleanup completed.	Cu, Zn	point source (boat wash)

HEAD OF HYLEBOS WATERWAY PROBLEM AREA
COMMENCEMENT BAY NEARSHORE/TIDEFLATS SUPERFUND SITE(a)

List 3 - Confirmed Sources(b)

Map No.	Site Name(c)	Status	Contaminants(d)	Pathways
22	Kaiser Aluminum and Chemical Corp.	Major site. Upgraded NPDES permit being implemented. MTCA cleanup done.	HPAH, LPAH	stormwater, process wastewater
25	Louisiana Pacific Log Yard	Major site. MTCA cleanup site. Enforcement Order for cleanup signed 1992. Cleanup scheduled for summer of 1993.	As, Cu, Pb, Zn	stormwater
29	Modutech Marine, Inc.	Applied for Small Boatyard Permit. Independent sandblast grit cleanup ongoing.	Cu, Zn	stormwater, shoreline sediments
30	Murray Pacific Log Yard #1	MTCA cleanup site. Cleanup due in 1994.	As, Cu, Pb, Zn, Cr	stormwater
31	Nordlund Boat Company, Inc.	Will apply for Small Boatyard Permit.	Cu, Zn	point source (boat wash)
42	Tacoma Boatbuilding Co. Yard #1	Major site. NPDES permit issued 3/93.	As, Cu, Pb, Zn	stormwater
43	U.S. Gypsum Interiors	Formerly U.S. Gypsum Company. Ecology drafting an Agreed Order for site investigation.	As, Cr, Cu, Pb, Sb, Zn	groundwater seeps
/	U.S. Gypsum Landfill	Drains to Hylebos Creek. Site cleanup took place in 1984. Post-cleanup monitoring shows groundwater contaminants are decreasing and are approaching MTCA cleanup levels.	As	groundwater

List 3 - Confirmed Sources(b)

Map No.	Site Name(c)	Status	Contaminants(d)	Pathways
45	Wasser Winters Log Yard	Major site. MTCA cleanup scheduled for summer 1993.	As, Cu, Pb, Zn	stormwater

(a) For source identification, the Head of Hylebos Waterway is defined as that portion of Hylebos Waterway south and east of Lincoln Avenue.

(b) All sites with drainage to Hylebos Waterway were considered to be potential sources of problem chemicals to the waterway. Probable sources (List 2) were identified through on-site inspections. Sites were put on List 3 - Confirmed Sources after sampling or further investigation of probable sources showed that the site was an ongoing confirmed source of problem chemicals to the waterway. Additional detail is provided in Ecology's site files, inspection reports, and in a Head of Hylebos Problem Area inspection notebook maintained by the Ecology UBAT supervisor at the Southwest Regional Office.

(c) Pending sites from List 2 that may be List 3 Confirmed Sources are:

Petroleum Reclaiming Services

(Information on this site is found on the List of Potential, Probable, and Confirmed Sources for the Head of Hylebos Waterway.)

(d) Additional problem chemicals or pathways may be present at sites. For source identifcation, Mouth and Head of Hylebos problem chemicals were combined.

ATTACHMENT A

FIFE DITCH AND HYLEBOS CREEK

SITES INSPECTED BY ECOLOGY

ATTACHMENT A

SITES INSPECTED BY ECOLOGY IN FIFE DITCH AND HYLEBOS CREEK
AS PART OF THE HYLEBOS WATERWAY SOURCE CONTROL EFFORT

Site Name*	Waterway	Comments	Action Taken	General Notice Letter
Art Morrison Enterprises 5301 8th Street East Fife, WA 98424	Fife Ditch	Auto parts manufacturing company. A parts tumbler discharges water, detergent, and wastes to parking area with eventual drainage to catch basin. Catch basin discharges to Fife ditch.	No Ecology action has been taken.	n
Bills Transfer 608 54th Avenue East Tacoma, WA	Fife Ditch	Effluent from vehicle trailer washing drains to storm drain. Lot uncluttered, clean, well maintained. No evidence of spills or careless practices on lot or in catch basins.	Existing information indicates no Ecology enforcement action is needed at this time. Requested that truck washing cease.	n
Fife Ditch**	Fife Ditch	Enters Hylebos Creek just upstream of mouth. TPCHD has done sampling/surveys to identify sources and educate businesses. Ecology has sampled. See Attachments B and C.	TPCHD source control efforts for individual businesses are ongoing.	n
Firesafe Corp. 1017 54th Avenue East Fife, WA	Fife Ditch	Retail store for safety/fire equipment. Recharging of fire extinguishers. Truck washing regularly.	Existing information indicates no Ecology enforcement action is needed at this time.	n
Grinnell Corp.** 1106 54th Avenue East Fife, WA	Fife Ditch	Fire sprinkler system manufacturer. Open drain runs across yard area and discharges to Fife Ditch via 54th Ave. E. storm lines. Elevated Pb, Zn, TPH in drain.	No Ecology action has been taken.	n

ATTACHMENT A

SITES INSPECTED BY ECOLOGY IN FIFE DITCH AND HYLEBOS CREEK
AS PART OF THE HYLEBOS WATERWAY SOURCE CONTROL EFFORT

Site Name*	Waterway	Comments	Action Taken	General Notice Letter
Joe Hall Construction** 1317 54th Avenue East Fife, WA	Fife Ditch	Storage of gas station/UST removal materials. Catch basins discharge to ditch and to 54th Ave. storm sewer. CB's are modified to act like oil/water separators. Poor waste management.	No Ecology action has been taken.	n
Milgard Mfg./Tempering** 1010-54th Avenue East Fife, WA 98411-0368	Fife Ditch	Mfg. of aluminum and vinyl windows. Window cleaning overflows to storm sewer may include detergent, glues. Small amounts of wash water to Fife ditch. Fork lift mtnce. on site. Vehicle wash water to ditch. Elevated Pb, Hg in catch basins.	No Ecology action has been taken. TPCHD source control efforts.	y
Navajo Northwest** 1108 54th Avenue Wast Tacoma, WA 98424	Fife Ditch	Formerly Parker Refrigerated Services, Rufus Parker Trucking. Truck & trailer fleet storage & maintenance. UBAT inspection 1991. Truck wash in yard. Diesel spill 11/91. Oily soil piles still on site.	Ecology Spills Section is working with site owners to remove oily soil piles.	n
Occidental - BPA Sludge Site 3702 Alexander Ave. Tacoma, WA 98421	Fife Ditch	Occidental sludge deposited on site contains trichloroethylene, 1,2 dichloroethylene, vinyl chloride. Other materials dumped on site contain arsenic.	Existing information indicates that contamination is not affecting Hylebos Waterway sediments. No Ecology enforcement action is needed at this time.	y
Tacoma Rainier Motor Freight 512 54th Avenue East Tacoma, WA 98424	Fife Ditch	Business was operated out of a house, but is not longer in business.	No action necessary.	n

ATTACHMENT A

SITES INSPECTED BY ECOLOGY IN FIFE DITCH AND HYLEBOS CREEK
AS PART OF THE HYLEBOS WATERWAY SOURCE CONTROL EFFORT

Site Name*	Waterway	Comments	Action Taken	General Notice Letter
Waste Management, Inc. 5306 7th Street East	Fife Ditch	Transfer and maintenance station for portable toilets. Some spillage of biocide. Yard storm and process water went to sanitary. TSU requested cease discharge of storm flows in 1991.	No action necessary.	n
Budget Battery Highway 99	Hylebos Creek	Catch basins sampled. Problem chemicals not identified.	Existing information indicates no Ecology enforcement action is needed at this time.	n
B & L Landfill Milton, Washington	Hylebos Creek	Woodwaste landfill in Milton. Woodwaste mixed with arsenic slag.	MTCA cleanup site. Cleanup construction started 7/13/92 and will be completed by 12/93.	y
Fjetland Property** 1621 Marine View Drive Tacoma, WA 98422	Hylebos Creek	A.K.A. Earth Enterprises, B & L Construction and Trucking, Portside Recycling, Executive Bark. Drains to Hylebos Creek just upstream of mouth. Elevated as, cu, pb, zn at woodwaste/ slag pile on part of property. Elevated as in storm basin sediments.	TPCHD/City are taking action re: solid waste issues. Existing information indicates contamination is not affecting Hylebos Waterway sediments. No Ecology enforcement action is needed at this time.	y
Foran Landfill 1635 Marine View Drive Tacoma, WA 98422	Hylebos Creek	Inert construction debris landfill and gravel pit. TPCHD permit. Site runoff flows to Hylebos Creek just upstream from mouth via Marine View Drive ditch. Cu, zn, bis (2ethylhexyl) phthalate slightly elevated above sediment quality objectives.	Existing information indicates no Ecology enforcement action is needed at this time.	y

ATTACHMENT A

SITES INSPECTED BY ECOLOGY IN FIFE DITCH AND HYLEBOS CREEK
AS PART OF THE HYLEBOS WATERWAY SOURCE CONTROL EFFORT

Site Name*	Waterway	Comments	Action Taken	General Notice Letter
Garner Trucking 407-B Porter Way Milton, WA	Hylebos Creek	Three acre unpaved site on property leased from H & H Diesel. Minor truck maintenance. Some fill came from B&L landfill prior to their use of ASARCO slag.	Existing information indicates that no Ecology enforcement action is needed at this time.	n
H & H Diesel** 407 Porter Way Milton, WA	Hylebos Creek	Diesel engine rebuild and repair shop. Site is built on fill, and is surrounded by ditches and Hylebos Creek. Some fill came from B & L log yard, prior to their use of ASARCO slag. Caustic wash water drains to sumps and is pumped to ditch periodically.	Ditch samples did not exceed cleanup objectives. No action has been taken.	n
J.D. Bertolini Industries, Ltd. 1222 46th Avenue E. Fife, WA	Hylebos Creek	Manufacturer and distributor of transportation equipment. Mishandling of paint wastes and other hazardous materials.	Site is under Ecology dangerous waste section.	n
Tacoma Bark Supply 1537 Marine View Dr. Tacoma, WA 98422	Hylebos Creek	Facility is now vacant. Used to be for shredding/storing/selling bark. UST removal in 1990.	Existing information indicates no Ecology enforcement action is needed at this time.	n
Tacoma Diesel Marine 444-54th Avenue East Tacoma, WA 98424	Hylebos Creek	Diesel engine repair and service. Oil/water separator discharges to Fife sanitary sewer.	Existing information indicates that no Ecology enforcement action is needed at this time.	n
U.S. Gypsum Landfill U.S. Highway 99 Pierce Co., WA 98354	Hylebos Creek	Pre-MTCA voluntary cleanup site. Ongoing monitoring shows groundwater contaminants are approaching MTCA cleanup levels. Drains to Hylebos Creek.	Site monitoring is ongoing.	y

ATTACHMENT A

SITES INSPECTED BY ECOLOGY IN FIFE DITCH AND HYLEBOS CREEK
AS PART OF THE HYLEBOS WATERWAY SOURCE CONTROL EFFORT

Site Name*	Waterway	Comments	Action Taken	General Notice Letter
Western Sup. Struct. Mfg.** 6713 Pacific Highway East Fife, WA 98424	Hylebos Creek	Formerly Western Engineering. Fabrication and repair of steel parts. Sediments built up inside low berm surrounding property.	Requested removal of accumulated sediments within berm. Sediments were removed.	y

*This list includes all sites which Ecology inspected that drain to Hylebos Creek and Fife Ditch. Sites which received a General Notice Letter are noted in last column.

**Preliminary results from the Tacoma-Pierce County Health Department Hylebos Creek Water Quality Project indicate that more information is needed about these sites. Other sites identified by the TPCHD study, but not inspected by Ecology, include: American Nichirei Seafoods, Hinshaw Accura, Fife Business Park, Fife Honda, Fife Sand & Gravel, Jesse Engineering, Lynden Transport, New West Gypsum, Pac Lease Trucking, Rainier Ballastics, Seattle Crane, and Topping Volvo Nissan.

ATTACHMENT B

FIFE DITCH AND HYLEBOS CREEK

SEDIMENT AND SUSPENDED PARTICULATE DATA

1989-1992

ATTACHMENT B
Hylebos Creek and Fife Ditch
Sediment and Suspended Particle Data, 1989-1992

Prepared by Department of Ecology, Southwest Regional Office, Urban Bay Action Team

PROBLEM CHEMICALS

1. Suspended Particulates: General Information on Methods

All sampling and analyses for suspended particulate contamination were conducted by the City of Tacoma -- neither the Washington State Department of Ecology nor the Tacoma Pierce County Health Department (TPCHD) took any water samples for suspended particulate contaminant analyses. All samples were taken between 1989 and 1992.

The sampling and analytical protocols used by the City of Tacoma (City) follow the procedures described in the "Surface Water Quality Study" issued by the City in 1990. The City sampled suspended particulates at three locations in the Hylebos Creek Watershed: sample station #8-City at the mouth of Hylebos Creek (low tide); sample station #9-City at the mouth of Fife Ditch (low tide), and sample station #10-City at Hylebos Creek where 4th Street ends (not influenced by tides).

The City used a continuous centrifuge each quarter during a dry event and, when site specific conditions allow, a rainfall event. Some particulate samples analyzed by the City of Tacoma in 1989 were not included in this report due to lack of supporting information on rainfall.

Quality assurance documentation is not available for any of the City's samples. The City agreed to provide quality assurance documentation to Ecology by November 15, 1992 for data collected from samples taken in 1992. That documentation has not yet been provided. Therefore, the quality of the data set is unknown and data results should be viewed with caution.

Table 11 contains a list of the parameters analyzed among the Commencement Bay Nearshore/Tideflats (CB/NT) problem chemicals for Hylebos Waterway.

2. Suspended Particulates: Mouth of Hylebos Creek (Map location #8-City)

Four wet weather water samples and seven dry weather water samples were gathered by the City of Tacoma from 1990-1991 (See Tables 1,2 and 3). It should be noted that B2EHP is a common laboratory contaminant. Based on our experience with this chemical and communication with City of Tacoma's lab, we doubt that the average level reported in Table 1 has enough "real" B2EHP to exceed the Commencement Bay Sediment Quality Objective. We may achieve more

certainty about this assessment if the City of Tacoma provides quality assurance information on 1992 samples. The QA Chemist at the City's lab is confident that the city has recently corrected the phthalate contamination problems by switching from soxhlet extraction methods to sonication.

3. Suspended Particulates: Mouth of Fife Ditch (Map location #9-City)

Seven wet weather water samples and ten dry weather water samples were gathered by the City of Tacoma from 1989-1992 (see Tables 5,6 and 7).

4. Suspended Particulates: Hylebos Creek at 4th Street (Map location #10-City)

Five wet weather water samples and nine dry weather water samples were gathered by the City of Tacoma from 1990 to 1992 (see Tables 8,9 and 10).

5. Bottom Sediments: Mouth of Fife Ditch, Marine View Drive Ditch and Fife Ditch at 4th Street (Table 4)

In 1991-1992, bottom sediment samples were taken by Ecology and/or TPCHD from the mouth of Fife Ditch (Map location #HC-4, TPCHD), the Marine View Drive Ditch location across Hylebos Creek from Fife Ditch Lift Station (Map location #HC-3, TPCHD), and the Fife Ditch at 4th Street (noted specifically on the map).

The results, presented on Table 4, show arsenic above the Commencement Bay Quality Objectives in bottom sediments at the mouth of Fife Ditch.

Bottom sediment samples from Fife Ditch at 4th Street had arsenic at levels below Commencement Bay Sediment Quality Objectives, but also had bis(2-ethylhexyl) phthalate at levels exceeding the Commencement Bay Sediment Quality Objective. Based on Ecology's quality assurrance information, the level of B2EHP appears high enough to be of concern despite the potential for laboratory contamination.

No exceedances of Commencement Bay Quality Objectives were found in the Marine View Drive Ditch sediments.

The TPCHD sampling, analysis, and QA procedures can be found in the TPCHD document titled: "Hylebos Creek Water Quality Project", released in April 1992. Table 11 identifes those chemicals that were analyzed by TPCHD.

Ecology samples were gathered off the top two centimeters of sediment. Routine procedures of sampling and chain-of-custody were followed. Table 11 identifies those parameters analyzed by Ecology. EPA and Ecology have the QA documentation.

6. Conclusions About Problem Chemicals

Suspended particulate data are presented in this report, but data results are not interpreted because QA documentation was not released by the City. Arsenic data are discussed in the main body of EPA's arsenic sediment technical memorandum (Attachment C).

B2EHP appears to exceed the Commencement Bay Sediment Quality Objectives in Fife Ditch bottom sediments (4th Street) even when the potential for laboratory contamination is considered. However, B2EHP does not appear to be a problem at the mouth of Hylebos Creek (see A.2), and average levels of B2EHP do not exceed Commencement Bay Sediment Quality Objectives in the sediment trap at the head of Hylebos Waterway (Norton and Barnard, 1992. Spatial and Temporal Trends in Contaminant Levels in Settling Particulate Matter: Hylebos Waterway (Commencement Bay), July 1990 to November 1991). Therefore, we conclude that Hylebos Creek should not be considered a source of B2EHP to the Hylebos Waterway sediments at concentrations that would cause exceedances of the Commencement Bay Sediment Quality Objectives.

B. SOURCES OF ARSENIC

1. Sources

Johnson and Norton (Ecology) investigated sources of arsenic to Hylebos Creek in 1985. Their report (memo to Jim Krull, dated January 25, 1985) indicated that the major contributors of arsenic loading were B&L Landfill/Ditch, Wasser Winters Log Sort Yard, Lousiana Pacific Log Sort Yard, and Fife Ditch. The log sort yards border the mouth of Hylebos Creek, while B&L Landfill drains to Hylebos Creek upstream from the 4th Street sampling location (just across Interstate 5). All three properties are currently active MTCA cleanup sites due to arsenic and other metals contamination. Remediation work should be complete by 12/93.

Data presented in this report complement the 1985 study by suggesting that arsenic on suspended particulates continues to be a problem both at the mouth of Hylebos Creek (Tables 1-3), upstream at 4th Street (Tables 8-10), and in Fife Ditch (Tables 5-7). However, QA documentation is not available for these suspended particulate data.

Once B&L Landfill is cleaned up, we expect that arsenic will approach background levels in suspended particulates at 4th Street. (See 1993 arsenic sediment data, Attachment C)

A site owned by BPA is a potential source of arsenic to Fife Ditch -- it drains to the ditch via a storm drain near the intersection of Taylor Way and East-West Road. Preliminary results from our lab show the arsenic concentration of material dumped at the site is 3190 ppm dry weight in the light grey "Oxy Sludge" and 937 ppm

dry weight in the dark grey or black metallic shot. Also, TCLP results on one sample found 5.01 mg/L arsenic. The metallic shot also contains small lumps of a slag-like substance.

Lousiana Pacific Log Sort Yard is another potential source of arsenic to Fife Ditch. About two acres of the sort yard drain to Fife Ditch. As indicated above, the sort yard is an ongoing MTCA cleanup site.

Once the three Hylebos Creek MTCA sites and the Fife Ditch source(s) of arsenic are cleaned up, we expect that arsenic will decline substantially in suspended particulates at the mouth of Hylebos Creek. In addition, the rate of decline could also depend on the success of source control for sources of arsenic to the head of Hylebos Waterway, because Hylebos Waterway can act as conveyor of arsenic to Hylebos Creek sediments via high tides.

2. Recommendations

We recommend including the following contributors of arsenic to Hylebos Creek on List 3 of the Head of Hylebos Problem Area Milestone 1 Report: Wasser Winters Log Sort Yard, Louisiana Pacific Log Sort Yard, and B&L Landfill (and the associated ditch). We do not recommend including the BPA Occidental Sludge site on List 3 because EPA's sediment data (Attachment C) show that the site is not expected to be a source to sediments in the Hylebos Waterway. B&L landfill (and the associated ditch) will be cleaned up by 6/93 (MTCA Order), and the Log Sort Yards will be cleaned up by 10/93 (MTCA actions).

TABLES

Table 1. Mouth of Hylebos Creek: Average of Wet and Dry Weather Suspended Particulate Contaminant Data From Tables 2 and 3, City of Tacoma, Map Location #8 City, 1990-1991; n=11. QA documentation not available.

Pollutant	Sediment Quality Objective (SQO) (ppm)	Mean (ppm)	Standard Deviation
arsenic (As)	57	58	63
copper (Cu)	390	52	58
lead (Pb)	450	54	75
zinc (Zn)	410	126	123
mercury (Hg)	0.59	0.13	0.14
bis(2-ethylhexyl) phthalate (B2EHP)	1.30	2.70	0.7
phenol	0.42	.35	.27

Table 2. Mouth of Hylebos Creek: Dry Weather Suspended Particulate Contaminant Data, City of Tacoma, Map Location #8 City, 1990-1991, ppm. QA documentation not available.

Date	As	Cu	Pb	Zn	Hg	B2EHP	Phenol
3/29/90	246	227	245	471	0.05	3.40	N.D.*
6/23/90	45	25	21	74	0.10	4.20	0.810
11/3/90	15	7	5	12	0.10	2.90	N.D.*
5/16/91	21	11	8	24	0.09	2.21	0.490
6/13/91	63	28	27	100	0.09	2.70	0.610
11/22/91	42	85	27	235	0.09	2.19	0.670
12/22/91	14	36	17	64	0.04	1.29	N.D.*

* N.D. = Not detected at detection limit, which is assumed to be one half of the lowest level measured in wet or dry weather samples (0.2 ppm (Table 3) x .5 = 0.1 ppm)

Table 3. Mouth of Hylebos Creek: Wet Weather Suspended Particulate Contaminant Data, City of Tacoma, Map Location #8 City, 1990-1991. QA documentation not available.

Date	As	Cu	Pb	Zn	Hg	B2EHP	Phenol
4/25/90	63	36	36	130	0.09	3.00	N.D.*
12/4/90	8	4	4	10	0.57	2.80	N.D.*
5/17/91	71	27	25	91	0.08	2.57	0.59
12/20/91	47	57	46	107	0.09	2.02	0.20

* N.D. = Not detected at detection limit, which is assumed to be one half of the lowest level measured in wet or dry weather samples (0.2 ppm x .5 = 0.1 ppm)

Table 4. Hylebos Creek and Fife Ditch: Bottom Sediment Data, Ecology and TPCHD, 1991-1992, ppm

Map Location	Date, entity	As	Cu	Pb	Zn	Hg	Phenol	B2EHP
HC-4 Fife Ditch at Lift Station	2/14/92 TPCHD	75	29	46	260	<0.1	na	na
HC-4, Fife Ditch at Lift Station	6/13/91 Ecology	210	70	87	360	<0.1	<3.2	<9.60
HC-3, Marine View Drive ditch	5/2/91 Ecology	36	51	32	93	0.02	na	na
HC-3, Marine View Drive Ditch	3/5/92 TPCHD	30	49	74	180	0.09	na	na
Fife Ditch @ 4th St	4/18/91 Ecology	<15	61	104	318	0.02	<4	9.00

na: not analyzed

Table 5. Fife Ditch at the Port of Tacoma Lift Station: Average of All Suspended Particulate Contaminant Data from Tables 6 and 7, City of Tacoma, Map Location #9-City, 1989-1992, n=16 (17 for B2EHP and phenol) QA documentation not available.

Pollutant	Sediment Quality Objective (ppm)	Mean (ppm)	Standard Deviation
arsenic	57	101	109
copper	390	59	48
lead	450	93	77
zinc	410	306	302
mercury	0.59	0.15	0.09
B2EHP	1.3	14.3	7.40
phenol	0.42	0.26	0.30

Table 6. Fife Ditch at the Port of Tacoma Lift Station: Dry Weather Suspended Particulate Contaminant Data, City of Tacoma, Map Location #9 City, 1989-1992, ppm. QA documentation not available.

DATE	As	Cu	Pb	Zn	Hg	B2EHP	Phenol
21-Jul-89	265.2	102.7	333	347	0.18	10.4	N.D.*
12-Apr-90	5.5	20	46	100	0.119	14.0	N.D.*
18-Jul-90	10	39.6	3.8	19	0.078	8.30	N.D.*
04-Nov-90	18	14	5.9	28	0.175	12.0	N.D.*
22-Feb-91	370	19	15	32	0.110	9.40	N.D.*
19-Mar-91	65	14	1.9	38	.136	11.5	N.D.*
26-Jun-91	87	26	27	210	.136	22.5	0.46
19-Sep-91	282	123	42.2	589	.050	9.84	N.D.*
24-Feb-92	9.98	67.5	61.9	224	.189	5.91	0.38
23-Mar-92	152	80	81.3	379	.138	7.2	0.80

* N.D. = Not detected at detection limit, which is assumed to be one half of the lowest level measured in wet or dry weather samples (0.2 ppm (Table 3) x .5 = 0.1 ppm)

Table 7. Fife Ditch at the Port of Tacoma Lift Station: Wet Weather Suspended Particulate Data, City of Tacoma, Map Location #9-City, 1990-1992, ppm. QA doucmentation not available.

DATE	As	Cu	Pb	Zn	Hg	B2EHP	Phenol
20-Apr-90	na	na	na	na	na	22.0	N.D.*
30-Aug-90	84	13	22	41	0.211	21.0	N.D.*
07-Nov-90	12	10	12	21	0.069	10.0	N.D.*
04-Apr-91	25	55	52	400	.051	11.0	0.36
09-Aug-91	127	78.3	130	977	.051	28.8	N.D.*
20-Nov-91	33.2	180	265	795	.440	30.8	N.D.*
17-Apr-92	64.6	107	130	701	.217	9.06	1.13

* N.D. = Not detected at detection limit, which is assumed to be one half of the lowest level measured in wet or dry weather samples (0.2 ppm (Table 3) x .5 = 0.1 ppm)

Table 8. Hylebos Creek at 4th Street: Average of All Suspended Particulate Contaminant Data From Tables 9 and 10, City of Tacoma, Map Location #10-City, 1990-1992, ppm, N=14. QA documentation not available.

Pollutant	Sediment Quality Objective (ppm)	Mean (ppm)	Standard Deviation
Arsenic	57	102	104
Copper	390	27	18
Lead	450	35	24
Zinc	410	121	79
B2EHP	1.3	4.57	2.67
Phenol	0.42	0.41	0.49

Table 9. Hylebos Creek at 4th Street: Dry Weather Suspended Particulate Contaminant Data, City of Tacoma, Map Location #10-City, 1990-1992, ppm. QA documentation not available.

DATE	As	Cu	Pb	Zn	Hg	B2EHP	Phenol
23-Apr-90	40	13	20	63	0.169	3.70	N.D.*
19-Jul-90	25	5.6	4.8	23	0.244	11.0	N.D.*
11-Oct-90	14	0.67	4.8	12	0.155	2.70	N.D.*
26-Feb-91	14	22	27	90	0.17	2.20	N.D.*
15-Apr-91	240	25	31	110	.225	2.58	0.45
11-Jul-91	110	30	44	130	.225	3.89	1.66
10-Oct-91	85.3	57.1	37.6	264	.120	3.57	1.01
25-Feb-92	77	46.6	54.3	163	.240	4.78	N.D.*
06-Apr-92	304	42.4	43.6	148	.211	3.35	1.03

* N.D. = Not detected at detection limit, which is assumed to be one half of the lowest level measured in wet or dry weather samples (0.2 ppm (Table 3) x .5 = 0.1 ppm)

Table 10. Hylebos Creek at 4th Street: Wet Weather Suspended Particulate Contaminant Data, City of Tacoma, Map Location #10 City, 1990-1992, ppm. QA documentation not available.

DATE	As	Cu	Pb	Zn	Hg	B2EHP	Phenol
31-May-90	52	22	45	130	0.141	2.40	N.D.*
12-Oct-90	15	3.6	5.8	16	0.265	5.40	N.D.*
24-May-91	70	20	29	110	.014	4.13	0.42
08-Aug-91	308	37.2	60.3	190	.014	9.95	N.D.*
24-Nov-91	70.3	55.3	91.5	248	.250	4.36	0.34

* N.D. = Not detected at detection limit, which is assumed to be one half of the lowest level measured in wet or dry weather samples (0.2 ppm (Table 3) x .5 = 0.1 ppm)

Table 11: Hylebos Waterway CB/NT Problem Chemicals Analyzed

Hylebos Waterway CB/NT Problem Chemical	Whether or Not Analyzed By:		
	City of Tacoma (Suspended Particulates)	Ecology (Bottom Sediments)	TPCHD (Bottom Sediments)
Arsenic	yes	yes	yes
Zinc	yes	yes	yes
Copper	yes	yes	yes
Lead	yes	yes	yes
Nickel	yes	no	yes
Antimony	no	yes	yes
Mercury	yes	yes	yes
PCB's	yes	yes	yes
LPAH's and HPAH's	yes	yes	yes
chloroethene	no	no	no
Tetrachloroethene	no	no	no
Phenol	yes	yes	no
Methylpyrene	?	?	no
Methylphenanthrene	?	?	no
Dibenzothiophene	yes	no	no
Ethylbenzene	no	no	no
Xylene	no	no	no
Chlorinated benzenes	yes (5)	yes (6)	no
Chlorinated butadienes	yes (1)	yes (1)	no
Benzyl alcohol	yes	yes	no
Biphenyl	yes	no	no
Pentachlorocyclopentane	?	?	no
Bis (2-ethylhexyl) phthalate	yes	yes	no

ATTACHMENT C

FIFE DITCH AND HYLEBOS CREEK

1993 ARSENIC SEDIMENT DATA

Technical Memorandum

Evaluation of Fife Ditch and Hylebos Creek
1993 Arsenic Sediment Data

21 May 1993

BACKGROUND

Arsenic contamination of the sediment in the Hylebos Waterway from potential upstream sources in Hylebos Creek and Fife Ditch was suggested based on bulk sediment data collected by the Tacoma-Pierce County Health Department and the Department of Ecology (Ecology) and suspended particulate data collected by the City of Tacoma from 1989 through 1992. However, these data were not considered conclusive because of laboratory and field issues affecting the interpretation of the results. The laboratory quality control data for the suspended particulate results presented in Attachment B of the Milestone 1 Head of Hylebos Report were not available. Also, these samples were collected under varying flow conditions and the linkage between arsenic concentrations in suspended solids and Hylebos bottom sediments was difficult to establish. Based on the results of these studies, it was determined that further evaluation of arsenic sediment concentrations in the Hylebos Creek and Fife Ditch was warranted.

Under the direction of EPA, Ecology performed additional sediment sampling study in 1993 to determine whether the Hylebos Creek and Fife Ditch serve as an ongoing source of arsenic to the sediment of the Hylebos Waterway. Thirty-three sediment samples were collected from 29 locations (see attached map) and analyzed for arsenic and grain size. The Ecology report and data tables are attached. The resulting sediment data were examined with respect to the Commencement Bay Nearshore/Tideflats Record of Decision (ROD) Sediment Quality Objective (SQO) of 57 mg/kg (dry weight) for arsenic.

This evaluation focuses on the potential impact of Hylebos Creek and Fife Ditch to the marine sediment in the Hylebos Waterway, and does not pertain to the water quality or environmental health of the Hylebos Creek or Fife Ditch. Fresh water sediment standards which would be applicable to Hylebos Creek are being developed by the state at this time, and they may be substantially different from the 57 mg/kg SQO established for marine sediments.

RESULTS

Results for the arsenic analyses are presented on the attached map and in Table 1 of the attached Ecology memorandum. Samples were initially analyzed by EPA Method 7960 (Graphite Furnace). If a sample concentration exceeded the calibration range, samples were reanalyzed

using EPA Method 6010 (ICP). Only ICP results are presented on the map when both analyses were performed. Samples were also analyzed for percent sediment fines (percent passing #200 sieve) to determine possible correlation between grain size and arsenic concentration in the sediment. Data underwent a validation review by Ecology's quality assurance group and were deemed acceptable. EPA's site file contains the laboratory data validation information. Replicate samples were averaged for presentation on the map. An arsenic value of 2.1N for location HYAS 2 was considered an anomalous value and not used for averaging purposes.

Hylebos Creek

Concentrations of arsenic in bottom sediment did not exceed the 57 mg/kg SQO at any station in the creek except at station HYAS 22, which was located in a drainage ditch adjacent to the B & L Landfill, a known arsenic contaminated site. The B & L Landfill and the surrounding drainage are currently undergoing remediation and therefore are not expected to persist as a potential arsenic source. Arsenic concentrations downstream of the B & L Landfill Site are below SQO's.

The mean concentration of arsenic in the bottom sediment in the Hylebos Creek upstream of the East-West Road Bridge (excluding HYAS 22) is 15 mg/kg (standard deviation is 9.8 mg/kg). There are no obvious trends or gradients in the arsenic distribution throughout the creek. Therefore, Hylebos Creek does not appear to be an ongoing source of arsenic contamination to the sediment in the Hylebos Waterway.

Fife Ditch

Arsenic concentrations above 57 mg/kg were detected at three locations in Fife Ditch: HYAS 7 (211 mg/kg) at the BPA site, a known arsenic contaminated site; HYAS 8 (126 mg/kg) at the wood chip pile storage yard drainage between Taylor Way and 4th Street; and at HYAS 5 (136 mg/kg), the Fife Ditch lift station. Concentrations upgradient of the chip pile storage yard are all less than 10 mg/kg. Samples collected between HYAS 8 and HYAS 5 had concentrations between 35 mg/kg and 45 mg/kg, indicating possible arsenic migration from the two upstream sources. Previous reports (see Attachment A of the Milestone 1 Head of Hylebos Waterway Report) also identified exceedences of the 57 mg/kg SQO at the lift station, but no exceedence at Fife Ditch and 4th Street sampling locations.

Stream flow volumes at the Fife Ditch discharge into Hylebos Creek (i.e., the lift station) were low, ranging from 2.25 to 2.67 cfs. At periods of high tide the water at this location may become stagnant due to the presence of a tide gate, and allow settlement of arsenic contaminated sediment from the water column. Bottom sediment arsenic concentrations in Hylebos Creek adjacent to and downstream from the lift station are all below 57 mg/kg, indicating that arsenic contaminated sediments are being trapped at the lift station and not moving into Hylebos Creek.

Grain Size

Inorganic substances tend to associate with the finer, more chemically active sediment fractions. To evaluate the relationship between arsenic and sediment grain size, sediment samples were analyzed for percent fines. A correlation analysis between percent fines and arsenic concentrations indicated no significant association ($r=0.21$, $P \leq 0.28$) between the distribution of arsenic and any particular sediment size.

Arsenic associated with coarser material may indicate proximity to the source, such as a slag. The sediment collected adjacent to the BPA site (HYAS 7) had 29 percent fines, and arsenic concentration of 211 mg/kg. A grit or shot-type material has been identified at the BPA Site. In contrast, the transported sediment collected from the lift station (HYAS 5) was much finer (77 percent fines) and had an arsenic concentration of 136 mg/kg.

CONCLUSIONS

The results of the analyses for arsenic in Hylebos Creek and Fife Ditch sediment show that 4 of 33 sediment samples exceed the arsenic SQO of 57 mg/kg. These exceedences occur near known arsenic contaminated sites: the B & L Landfill site that discharges to Hylebos Creek, and the BPA Site and wood chip pile storage yard site that discharge to Fife Ditch. Arsenic sediment concentrations also exceed the SQO at the Fife Ditch lift station, where transported sediments may be settling out during periods of low flow and high tides. There are no arsenic SQO exceedence trends throughout the Hylebos Creek and Fife Ditch. It does not appear that the Hylebos Creek or Fife Ditch are acting as a source of arsenic to the bottom sediments of the Hylebos Waterway at concentrations which would result in an exceedence of the 57 mg/kg SQO.

Mary Riveland
[illegible]
Director

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, LU-11 • Olympia, Washington 98504-6811 • (206) 753-2353

April 13, 1993

TO: Karen Keeley, EPA

FROM: Joyce Mercuri, Ecology
Commencement Bay Urban Bay Action Team

SUBJECT: Hylebos Creek and Fife Ditch Arsenic Study

At the request of EPA, the Department of Ecology gathered sediment samples from Hylebos Creek and Fife Ditch in Pierce County during February 1993. The objective of the sediment sampling was to characterize the arsenic concentrations in surface sediment in Hylebos Creek and Fife Ditch. The sampling and analysis plan was developed for EPA by Roy F. Weston, Inc. and is described in a letter to EPA dated January 21, 1993. The sampling and analysis plan was followed by Ecology staff, with a few exceptions which are described below.

A total of 33 samples from 29 stations were gathered and sent to the Ecology's Manchester Laboratory to be analyzed for arsenic concentration and grain size. This includes samples 2 and 16 which were gathered in triplicate to assess lab variability. Ecology staff added three additional sampling stations over those specified in the sampling plan. These additional stations were added, *based on best professional judgment of the field staff, to provide a more* refined characterization of arsenic distribution. Sampling stations are shown on Figure 1. Diversions from the planned sampling stations are described below:

+Station 6A was added on Fife Ditch just upstream of the Taylor Way bridge in order to provide a "background" sample for station 6, which is just downstream of an outfall that originates from Louisiana Pacific Log Sort Yard, a site with arsenic contaminated soils.

+Station 32 was added on a small drainage ditch approximately 1/4 mile upstream from sample station 22. Station 32 is immediately south of and slightly upstream from the B & L Landfill, and provides a "background" sample for station 22. This station is close to the Tacoma-Pierce County Health Department (TPCHD) sampling station #74.

+Station 33 was added on a drainage channel which represents cumulative flow from the network of drainage ditches southeast of I-5 which drain B & L landfill and agricultural and residential land. This station had shown elevated arsenic in a 1992 TPCHD sample (TPCHD station #80.2).

+No sample was taken at station 14 on Hylebos Creek because the site was not accessible without wading the creek. Also, this station is less than 1000 feet downstream of station 15, and there are no known potential sources between the two stations.

+A triplicate sample was taken at station number 16, not station number 6 as described on page two of the sampling and analysis plan. Station 16 was identified as the triplicate station on the table of proposed sediment sample stations in the sampling and analysis plan. Apparently, reference to station 6 in the text was a typographical error.

Samples were collected on February 5 by Ecology staff Joyce Mercuri and TPCHD staff Peter Isaksen, and on February 11 and 24 by Ecology staff Joyce Mercuri and Marv Coleman. No major rainfall events had occurred within 48 hours of any of the sampling days. Samples of 0-6 centimeters of surface sediments were collected using a petite ponar sampler where access was possible such as from a bridge. At stations where an overpass was not available, samples were gathered using a hand held polyurethane scoop with an extension handle. Samples were collected from midstream, quiescent, depositional areas to the extent possible. At stations where there was not a bridge to sample from, an attempt was made to sample as far toward the center of the channel as was feasible with the hand held scoop. Station log sheets are provided in Attachment A.

An effort was made to retain fine sediments where present, and all samples were homogenized in a stainless steel bowl utilizing a stainless steel spoon prior to depositing sediments in the sample jars for arsenic analysis and plastic bags for the grain size analysis. Sampling equipment was cleaned between samples.

Triplicate samples were taken at stations 2 and 16. The original intent was to assess field variability by gathering three samples at each station. Instead, due to staff misinterpreting the sampling and analysis plan, lab variability was assessed by splitting one homogenized sample into three separate jars for analysis.

Samples were kept on ice in an ice chest during the work day. At the end of the day the sealed ice chests were transferred to the walk-in cooler at the Ecology Southwest Regional Office. The lab courier picked the samples up from the walk-in cooler and transported them to Manchester Laboratory within five days.

Samples were analyzed for arsenic at the Manchester Laboratory. Grain size analysis was performed by Soil Technology under contract with the Manchester Laboratory. Analytical results are shown in Table 1. A memorandum from the Manchester Laboratory dated April 5, 1993 describing extraction and analysis methods and quality assurance/quality control for arsenic analysis is found in Attachment B. Data sheets from the laboratory are provided in Attachment C.

TABLE 1

HYLEBOS CREEK AND FIFE DITCH ARSENIC STUDY, FEBRUARY 1993
LABORATORY RESULTS

FIELD STATION	ECOLOGY LAB NUMBER	GRAIN SIZE (%PASSING NO. 200 SIEVE)	ARSENIC MG/KG DRY WT.	COMMENTS
HYAS 1*	078230	75	55.1	Mouth of creek at waterway.
HYAS 2*	078231	1	22.0	From East/West Road bridge. Split with HYAS 28 and HYAS 29.
HYAS 28*	078257	1	24.0	Split with sample HYAS 2 and HYAS 29.
HYAS 29	078258	1	2.1N	Split with sample HYAS 2 and HYAS 28.
HYAS 3	078232	60	7.8N	Marine View Dr. ditch near Fjetland property.
HYAS 4	078233	3	19.8N	Hylebos Creek upstream from Marine View Drive ditch.
HYAS 5*	078234	71	136	Fife Ditch at lift station.
HYAS 6*	078235	66	35.9	Fife Ditch just downstream of Taylor Way bridge.
HYAS 6A*	078263	81	45.4	Fife Ditch just upstream of Taylor Way bridge. This station was added by field staff.
HYAS 7*	078236	29	211	Terminus at culvert of small drainage course that runs through BPA-Occidental property at Taylor Way and East-West Road.
HYAS 8*	078237	44	126	On Fife Ditch between Taylor Way and 4th St. East. Sample taken just downstream of small drainage coming from wood chip storage yard.

FIELD STATION	ECOLOGY LAB NUMBER	GRAIN SIZE (%PASSING NO. 200 SIEVE)	ARSENIC MG/KG DRY WT.	COMMENTS
HYAS 9	078238	55	7.1N	Fife Ditch at 4th St. East.
HYAS 10	078239	23	6.4N	Fife Ditch at 8th St. East.
HYAS 11	073240	28	6.5N	Fife Ditch at 12th St. East.
HYAS 12	078241	65	4.5	Fife Ditch along 8th St. East.
HYAS 13*	078242	7	30.0	At bridge over Hylebos just upstream from Fjetland property.
HYAS 14	078243	Not analyzed	Not analyzed	Limited access prevented sampling this station. Station is in between HYAS 15 and HYAS 13.
HYAS 15*	078244	1	29.0	At dead end of 4th Street, downstream from road end.
HYAS 16*	073245	0	14.1N 22 (ICP)	Bridge over Hylebos Creek at 8th Street East. Split with HYAS 30 and HYAS 31.
HYAS 30*	078259	0	14.8N 21 (ICP)	Split with HYAS 16 and HYAS 31.
HYAS 31*	078260	1	13.8N 20 (ICP)	Split with HYAS 16 and HYAS 30.
HYAS 17*	073246	0	11.0N 18 (ICP)	Bridge over Hylebos Creek at 52nd Ave. East, just upstream from HYAS 16.
HYAS 18	078247	26	16.9	Bridge over Creek at 12th St. East.
HYAS 19	078248	1	12.9	Near dead end of 67th Ave. East.
HYAS 20	078249	40	14.1	Just downstream of Highway 99 bridge over Hylebos Creek.
HYAS 21	078250	89	11.3	East of I-5, where ditch from B & L Landfill joins agricultural ditch.

FIELD STATION	ECOLOGY LAB NUMBER	GRAIN SIZE (%PASSING NO. 200 SIEVE)	ARSENIC MG/KG DRY WT.	COMMENTS
HYAS 22*	078251	97	77.5	Just downstream from B & L Landfill. Extensive recent sediment disturbance from construction. Silt fences in ditch.
HYAS 23	078252	18	6.8	Upstream of HYAS 21 on agricultural ditch. From wood footbridge.
HYAS 24	078253	2	7.3	West of I-5 at Freeway Trailer Sales. From concrete bridge over Hylebos Creek.
HYAS 25	078254	0	2.3	On Hylebos Creek just downstream from Northwest Bus Sales/H & H Diesel sites.
HYAS 26*	078255	75	9.5 20 (ICP)	Tributary ditch upstream from H & H Diesel.
HYAS 27	078256	0	2.6	From private bridge just downstream of Porter Way.
HYAS 32	078261	85	5.7	Adjacent to B & L Landfill. This station was added by field staff. Extensive recent sediment disturbance from construction.
HYAS 33*	078262	76	33.8	Just upstream from station 20, adjacent to old motel on Hwy. 99. This station was added by field staff.

*All arsenic samples were analyzed by EPA Method 7060, the graphite furnace atomic absorption (GFAA) method for arsenic. All samples were first run by GFAA. In samples with higher concentrations, the sample results were outside the calibration range of the GFAA instrument. In those cases, the samples were then analyzed by the inductively coupled plasma method (ICP) which can more accurately measure the higher concentrations. In some cases, both results are presented.

N) Some of the sample results which were determined by the GFAA method are flagged with an "N". This is because the quality assurance matrix spike recoveries for those samples was outside of the laboratory guideline range of +/- 25%. The flagged samples may show a slight bias toward higher concentrations.

HYLEBOS CREEK
PERCENT PASSING U.S. SIEVE NO. 200*
(ASTM D-1140)

TABLE 1

Exploration Number	Sample Number	Percent Passing U.S. Sieve No. 200
HYAS 5	078234	71
HYAS 6	078235	66
HYAS 6A	078263	81
HYAS 7	078236	29
HYAS 12	078241	65
HYAS 13	078242	7
HYAS 15	078244	1
HYAS 16	078245	0
HYAS 17	078246	0
HYAS 18	078247	26
HYAS 19	078248	1
HYAS 20	078249	40
HYAS 21	078250	89
HYAS 22	078251	97
HYAS 23	078252	18
HYAS 24	078253	2
HYAS 25	078254	0
HYAS 26	078255	75
HYAS 27	078256	0
HYAS 30	078259	0
HYAS 31	078260	1
HYAS 32	078261	85
HYAS 33	078262	76

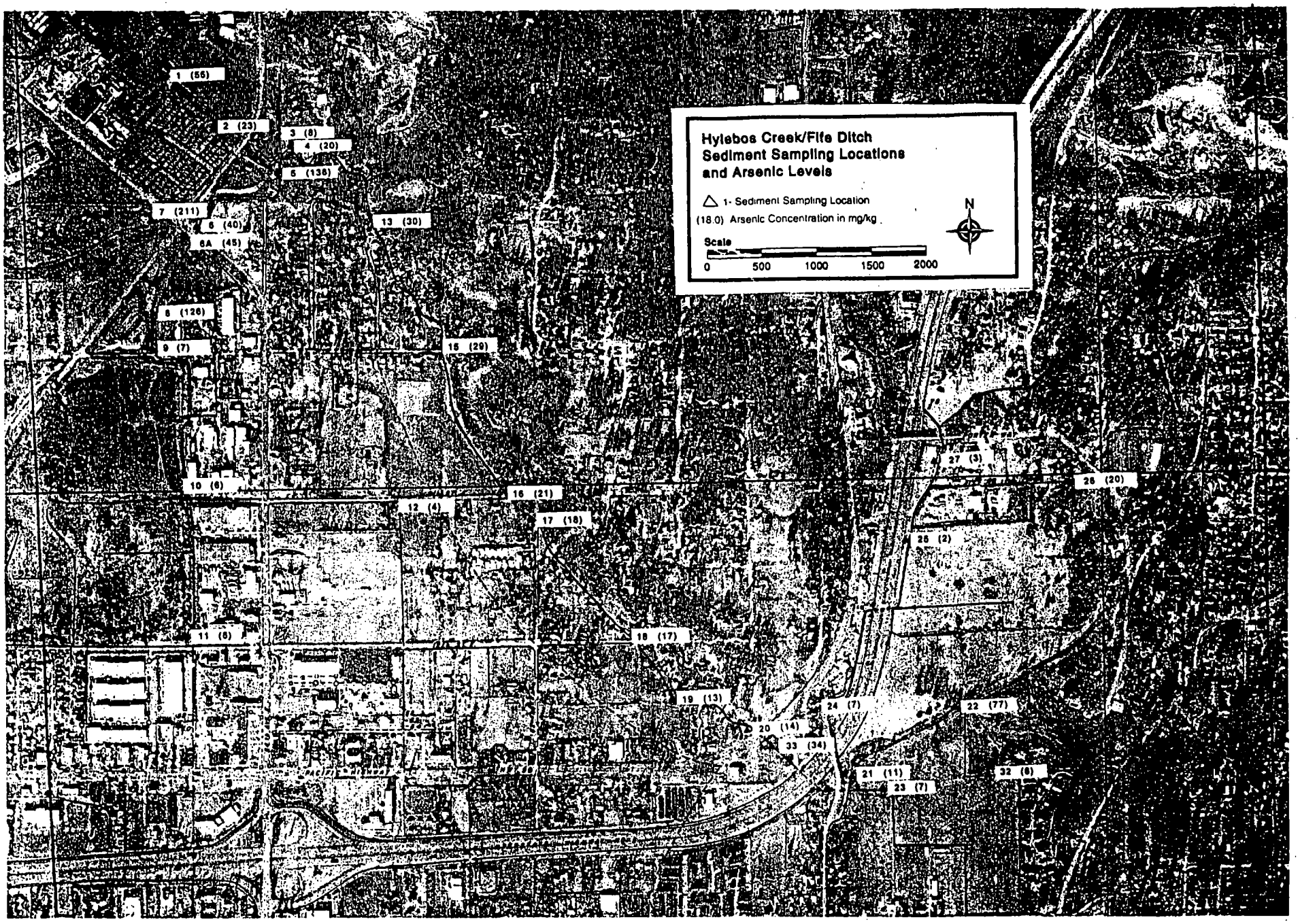
* The samples were "washed" through the No. 200 mesh sieve to determine the relative percentages of coarse and fine-grained material in the samples. The tests were performed in general accordance with ASTM D-1140. The results are presented on Table 1 as percent passing or finer than the No. 200 sieve.

HYLEBOS CREEK
PERCENT PASSING U.S. SIEVE NO. 200*
(ASTM D-1140)

TABLE 1

Exploration Number	Sample Number	Percent Passing U.S. Sieve No. 200
HYAS 1	078230	75
HYAS 2	078231	1
HYAS 3	078232	60
HYAS 4	078233	3
HYAS 8	078237	44
HYAS 9	078238	55
HYAS 10	078239	23
HYAS 11	078240	28
HYAS 28	078257	1
HYAS 29	078258	1

* The samples were "washed" through the No. 200 mesh sieve to determine the relative percentages of coarse and fine-grained material in the samples. The tests were performed in general accordance with ASTM D-1140. The results are presented on Table 1 as percent passing or finer than the No. 200 sieve.


Hylebos Creek/Fife Ditch
Sediment Sampling Locations
and Arsenic Levels
△ 1- Sediment Sampling Location
(18.0) Arsenic Concentration in mg/kg
Scale
0 500 1000 1500 2000
N
1 (55)
2 (23)
3 (8)
4 (20)
5 (136)
7 (211)
8 (40)
8A (45)
13 (30)
8 (126)
9 (7)
15 (29)
10 (6)
16 (21)
12 (4)
17 (18)
27 (3)
28 (20)
26 (2)
11 (6)
18 (17)
19 (13)
20 (14)
33 (34)
24 (7)
22 (77)
21 (11)
23 (7)
32 (6)